SORGHUM MIDGE *CONTARINIA SORGHICOLA* (COQUILLETT) (DIPTERA: CECIDOMYIIDAE) IN AUSTRALIA PRODUCES UNISEXUAL PROGENY

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Abstract

All mated females of the sorghum midge *Contarinia sorghicola* from Queensland produced unisexual progenies in equal male/female proportions. Females tested originated from *Sorghum halepense* in November and April and cultivated grain sorghum *S. bicolor* in January and April. The results have implications for the possible development of resistance-breaking biotypes on midge-resistant sorghum.

Introduction

Baxendale and Teetes (1981) showed that the sorghum midge *Contarinia sorghicola* (Coquillett) in Texas, USA, produces exclusively unisexual progeny. However, in reported cases of unisexual progeny production in species with bisexual reproduction, some individuals may produce bisexual progeny, as in another cecidomyiid, the Hessian fly *Mayetiola destructor* (Say) (Painter 1930).

Grain sorghum hybrids with resistance to the sorghum midge have been developed recently and are available to Australian farmers (Henzell *et al.* 1991). A knowledge of progeny production by the sorghum midge in Australia is a prerequisite for any theoretical assessment and/or experimentation on the development of biotypes capable of 'breaking' resistance.

Materials and methods

Progeny production tests were carried out on females originating from four different collections of infested material: 1) Johnson grass *Sorghum halepense* at Gatton, south-east Queensland, November 1990; 2) grain sorghum *S. bicolor* at Gatton, January 1991; 3) grain sorghum at Kingsthorpe, south-east Queensland, April 1991; and 4) Johnson grass at Emerald, central Queensland, April 1992. Females emerging with males in the laboratory early in the morning were caged individually over flowering sorghum panicles in a glasshouse. Adult progeny emerging were sexed. Each female produces only one brood.

Results

Offspring produced by each female were either all male or all female. Of the 31 females producing offspring, 15 produced male broods and the remainder produced females (Table 1). Average size (± s.e.) of female broods was 22.6 ± 3.8 individuals and of male 23.0 ± 3.9.

Discussion

Baxendale and Teetes (1981) also found a near 1:1 ratio of female-producing females to male-producing females.

Table 1. Numbers of all male or all female broods produced by 31 *C. sorghicola* females from four collections.

Locality	Host	Date	Number of broods	
			Male	Female
Gatton	*S. halepense*	xi.1990	1	6
Gatton	*S. bicolor*	i.1991	8	5
Kingsthorpe	*S. bicolor*	iv.1991	3	3
Emerald	*S. halepense*	iv.1992	3	2

By negating the possibility of mating between siblings, the production of unisexual progeny has implications for the likelihood and rate of development of midge biotypes that are unaffected by resistance factors (Gould 1986). However, whether enforced outcrossing enhances or reduces adaptation to resistance factors is unclear. In *Mayetiola destructor* the genetics of reproduction are unusual and complex and include the elimination of paternally derived chromosomes (Stuart and Hatchett 1991). These processes have not been studied in the sorghum midge but may be assumed to be similar and, if so, would also have an influence on biotype development. For example, if resistance-breaking ability was sex-linked then the loss of paternally derived chromosomes would have an obvious influence. Discussion on other more complex aspects is beyond the scope of this paper but work is required on the reproduction genetics of sorghum midge prior to formulation of a conceptional model of the development of resistance-breaking biotypes.

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